

# ATHABASCA RIVER BRIDGE

## Introduction

The Athabasca River Bridge was selected for a replacement project by Alberta Transportation. The goals of this replacement are to construct a wider bridge to improve safety and traffic flow, maintain the connection between the North/South shore of the river and reduce traffic disruptions due to maintenance on the existing bridge.

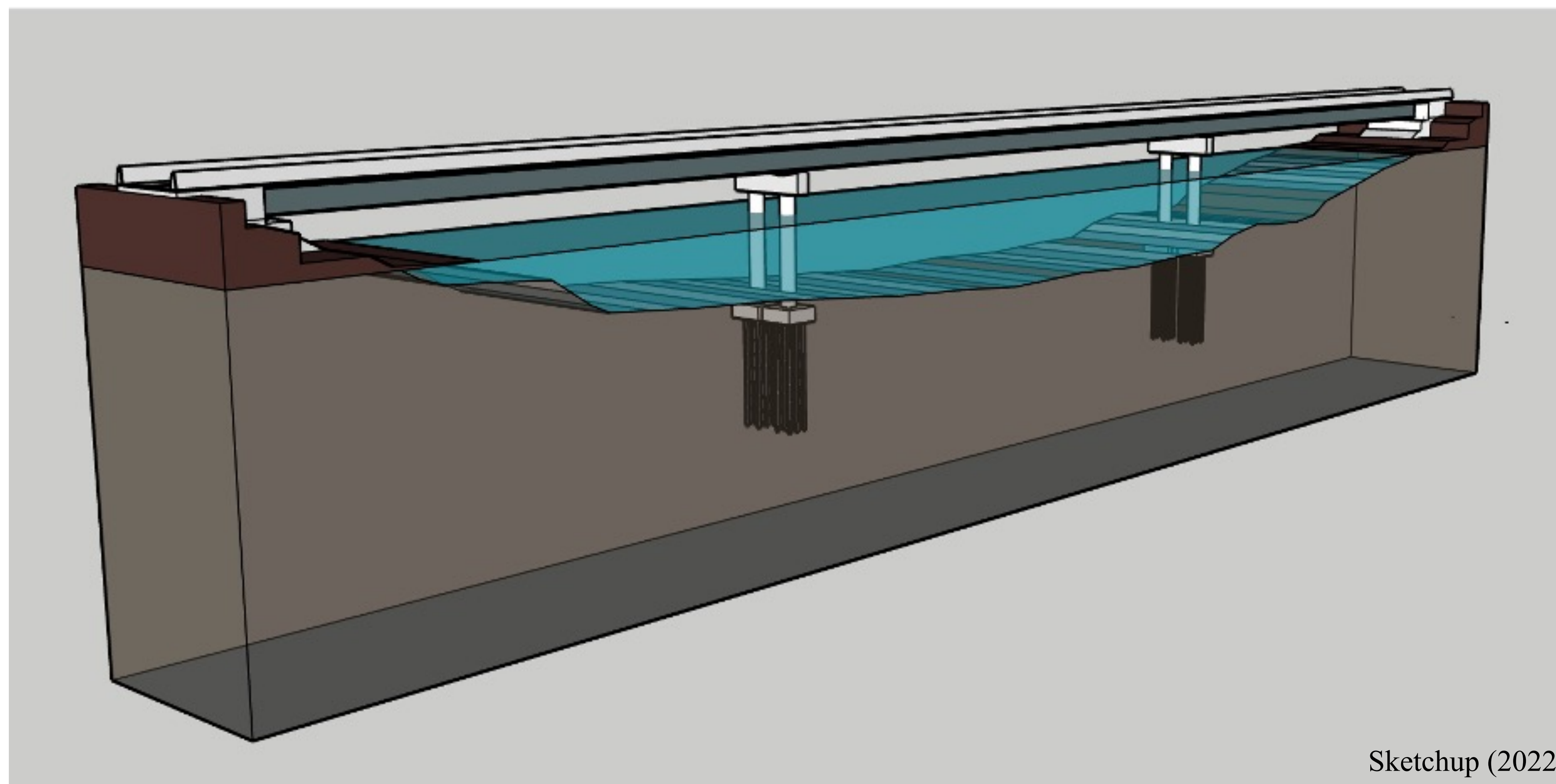
The project scope included the detailed design of the bridge deck and girders, and the preliminary design of the piers and abutment. Additional deliverables included a detailed drawing package and a construction schedule.



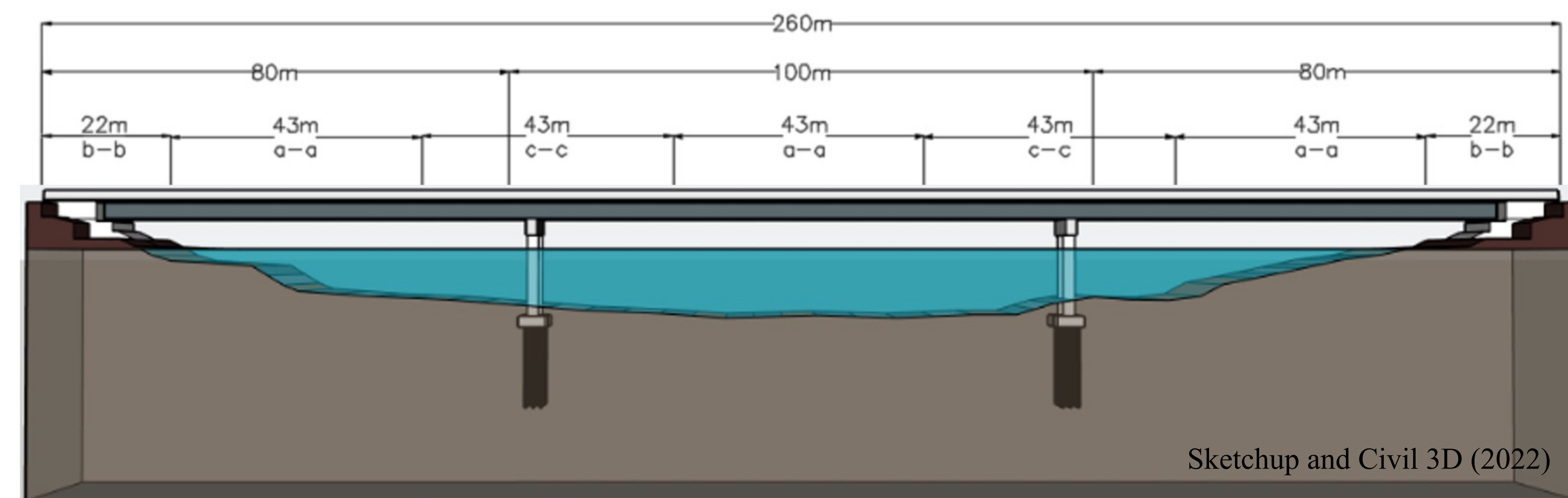
Location of bridge (Google Maps, 2022)

## Details of Design

- The bridge is 260-meters long, 12-meters wide and has 2 active vehicle lanes.
- 90-millimeters of asphalt surface layer.
- 225-millimeter-thick concrete bridge deck.
- The bridge cross section will have four steel girders spaced at 3-meters.
- Three steel girder sections were designed to optimize the girder.
- A total of eight splice locations occur through the length of the bridge.
- The total substructure height is 32.5-meters.
- 5.6-meter clearance between highest water elevation and superstructure.



Sketchup (2022)



Sketchup and Civil 3D (2022)

Cost Analysis	
Superstructure	\$4,838,382.00
Substructure	\$1,484,947.00
Labour	\$7,352,000.00
Equipment	\$2,231,600.00
Contingency (15%)	\$2,386,039.00
Engineering Fee (10%)	\$1,590,693.00
<b>Total Cost</b>	<b>\$19,883,661.00</b>

## Recommendations

- A steel girder bridge is recommended for this project.
- The design was optimized by using three bridge spans, with three girder sections spliced throughout the total bridge length.
- A detailed analysis of the pier and abutment must be completed prior to construction.
- Proper guided bridge bearings must be selected and installed.
- To optimize sustainability, eco-friendly construction materials are recommended for the project. For the girders, weathering steel will be used to reduce maintenance.
- Construction of the bridge was estimated to be completed within three construction seasons.
  - Winter: piling and pier installation
  - Spring: construction of superstructure
  - Summer: cast deck and asphalt

## Design Process

### Literature review

- Types of bridges.
- Design of girder, deck and foundation.

### Preliminary design: Concrete and steel girder bridge

- Simplified method of analysis as per CSA S6:19.
- Calculated the applied loading due to dead, live, and wind loads (Chapter 3, CSA S6:19)
- Preliminary design of steel and concrete girder options.
- Cost analysis for bridge type recommendation.

### Detailed design: Steel girder bridge

- Detailed design of steel girder (Chapter 10, CSA S6:19) and deck (Chapters 5 & 8, CSA S6:19).
- Preliminary design of pier and abutment.
- Determined minimum reinforcing based on factored loads.
- Class B cost analysis.
- Construction schedule

## References

- Alberta Transportation. 2013. Athabasca River Bridge Project Fact Sheet.
- Alberta Transportation. 2021. Unit prices and cost adjustments.
- Bridge Structure Design Criteria. Alberta Government. 2018.
- CSA S6:19, 2019.

## Girder Cross Section (Civil 3D, 2022)

